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Description

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Device for placing flip chips on a substrate

- 5 The invention relates to a device for placing flip chips on a substrate in the form of a leadframe, the device having a movable placement head, which picks up the flip chips from a stock of components and places them on the substrate.
- 10 Flip chips of this type are usually presented with their connection elements pointing upward. What are known as wafer handlers are provided with a turning device for the flip chips, so that the placement head,
- 15 which can move in a placement plane, of a placement device can pick up the flip chips in their correct insertion position and place them onto a printed-circuit board at the intended for this purpose.
- 20 The flip chips are presented, for example in accordance with JP 161027 A (cf. Patent Abstracts of Japan, vol. 13, No. 270, of July 21, 1989), in a wafer with their connection elements pointing upward. A movable removal head of a wafer handler removes the flip chips from the
- 25 wafer and deposits them on a stationary turning device, by means of which they are deposited in a turned position on a transfer station, from which the removal head picks them up and places them in the correct insertion position with the connections downward onto a
- 30 semiconductor substrate, which is usually in the form of a strip-like leadframe for the production of packaged components and is passed through the placement station in a cyclical manner.
- 35 Furthermore, US 5 839 187 discloses a device for the handling of flip chips, in which the flip chips are removed from a wafer by means of a gripper. The gripper is pivoted about a horizontal axis and, turned

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in a transfer station, transferred to a positioning gripper, which deposits the flip chips into a flat magazine.

- 5 Furthermore, US 5 667 129 A (claim 7) discloses a placement head for placing flip chips on a substrate, the placement head having a turning device (not represented in any more detail) for the flip chips.
- 10 The invention is based on the object of reducing the complexity of a device for the placement of components on the substrates.

- 15 This object is achieved by the invention according to claim 1. The freely positionable placement head can be moved in a positioning system in such a way that its range of movement covers the entire area of the wafer and the fixed substrate, for example in the form of a printed-circuit board. The placement head can
- 20 therefore remove the flip chips directly from the wafer, move over the substrate, turn in its accompanying turning device in the time between the pickup and placement on the substrate and, after turning, place the flip chips onto the substrate. This
- 25 measure allows all the essential functions of the pickup, transportation, turning and placement of the components to be carried out with a single handling system in a time-saving manner, making it possible to dispense entirely with the wafer handler. The use of a
- 30 turret placement head 2 makes it possible to pick up a multiplicity of flip chips in rapid succession from the wafer and turn them between two holding stations. Subsequently, the multiplicity of flip chips held on the grippers are placed on the substrate in just as
- 35 rapid succession. This reduces the number of movement operations considerably, which is accompanied by a corresponding time saving. The placement head also has the advantage that a single turning station is required

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for all the components held on the grippers and that the respective gripper does not have to wait for the complete turning operation, but instead the component

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is passed on to the next station as it is turned and can be picked up again there are without losing any cycle time.

- 5 Advantageous developments of the invention are characterized in claims 2 to 5:

10 The development according to claim 2 realizes the turning device in a simple way with few additional elements.

15 The development according to claim 3 allows flip chips to be safely transferred between the various suction surfaces.

20 The development according to claim 4 allows flip chips of different thicknesses to be handled without readjustments.

25 The development according to claim 5 allows the turning device to be of a compact and lightweight design.

The invention is explained in more detail below on the basis of an exemplary embodiment represented in the drawing.

Figure 1 shows in a schematized form a side view of a placement head for flip chips,

30 Figure 2 shows another side view of the placement head according to figure 1,

35 Figure 3 shows a detail of the placement head according to figure 1 in another working phase.

According to figures 1 and 2, a turret-like placement head 1 has a stator 2 and a rotor 3, on which a

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5 multiplicity of radially protruding grippers 4 are arranged in a circulating manner. The placement head 1 is freely positionable in the direction of the perspectively represented arrows X and Y in a plane parallel to the wafer and the substrate. In the position represented in figure 1, it is located over a

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wafer 5, on the upper side of which flip chips 6 are presented close together in rows with their connection side upward.

5 The gripper 4, located in the lower turning position, is directed at one of the flip chips 6 and can be telescopically lowered onto it. Said flip chip is sucked onto the end of the gripper and lifted together with the latter off the wafer 5. By moving the  
10 placement head 1 and turning the rotor 3, all the grippers 4 can be successively loaded with the flip chips 6. One of the holding stations of the grippers 4 is assigned a first holder 7, which is aligned by its end with the end of the gripper 4.

15 The flip chip 6 sucked onto the gripper can then be transferred to the holder 7 and sucked onto the end of the latter. By pivoting into a transfer position, represented by dash-dotted lines, the flip chip 6 can  
20 be transferred to a further holder 7, which is directed oppositely facing the first holder and which then takes up the flip chip 6 on its connection side. The second holder 7 is assigned to a downstream holding station of the placement head 1. It can be pivoted out of the  
25 transfer position into a delivery position, which is in line with the gripper 4 of the second holding station and in which the gripper 4 receives the component on its upper side, facing away from the connection side.

30 In figure 3 it is shown how the flip chip 6 can be transferred between the holders 7 and turned in a time-saving manner during the rotation of the rotor 3.

After the turning of the flip chips 6, they are  
35 successively transported into a placement position, represented in figure 2, in which they can be placed in the correct position onto a substrate 8 to be provided with placed components.